Index of Sales of New Passenger Automobiles

IN THIS issue is presented a new monthly index of dollar sales of new passenger automobiles.[1] This is the second of a series of indexes of retail sales planned by the Bureau at the request of the executive council, for the purpose of measuring changes in the volume of purchases by final consumers.[2]

It is to be noted particularly that this index was so constructed as to portray primarily the trend of consumer purchases of new passenger automobiles rather than the trend of total business of automotive dealers generally. It may, however, be considered a fairly good indication of the latter, inasmuch as the new-car business of automobile dealers constitutes almost one half of their total volume.

Relation of New Car Business to Total Retail Trade

It is estimated that the retail sales of new passenger cars are from 6 to 8 percent of the total retail trade of the country.

According to the 1929 Census of Retail Distribution, the entire automotive group, including filling stations, garages, tire and accessory dealers, etc., had a volume of $9,615,810,000, or nearly 20 percent of all retail sales. This was second only to the food group with 22 percent of total retail sales.

Within the automotive group the major type of outlet was the automotive sales room which accounted for almost two thirds of the group total. About 47 percent (slightly under 3 billion dollars) was made up of new passenger automobiles. This census figure, plus an allowance for new cars sold through other channels, or bought direct from the factory, accords within less than 3 percent with the estimate of the dollar volume in 1929, computed as a step in the preparation of the present index, and serves as a partial check, at least, on the accuracy of the index.

Advantages Over Previously Available Data

Up to this time there have been no data currently published indicating the trend in the *dollar value* of new passenger car sales. Registration figures have been available and in normal times they undoubtedly offer a rather accurate picture of the general trend in unit sales.

The data on sales used in this index represent the number of cars actually sold each month, whereas the registration figures are unduly decreased or increased

[1] This index was constructed by Walter Mitchell, Jr., and J. Harold Stehman, in the Domestic Commerce Division of the Bureau of Foreign and Domestic Commerce, under the general supervision of Dr. Willard L. Thorp, Director of the Bureau.

[2] The March 1934 issue of the Survey of Current Business (pp. 17-20) contained a description of the index of variety store sales. Other indexes are being prepared or grocery store sales and rural sales.

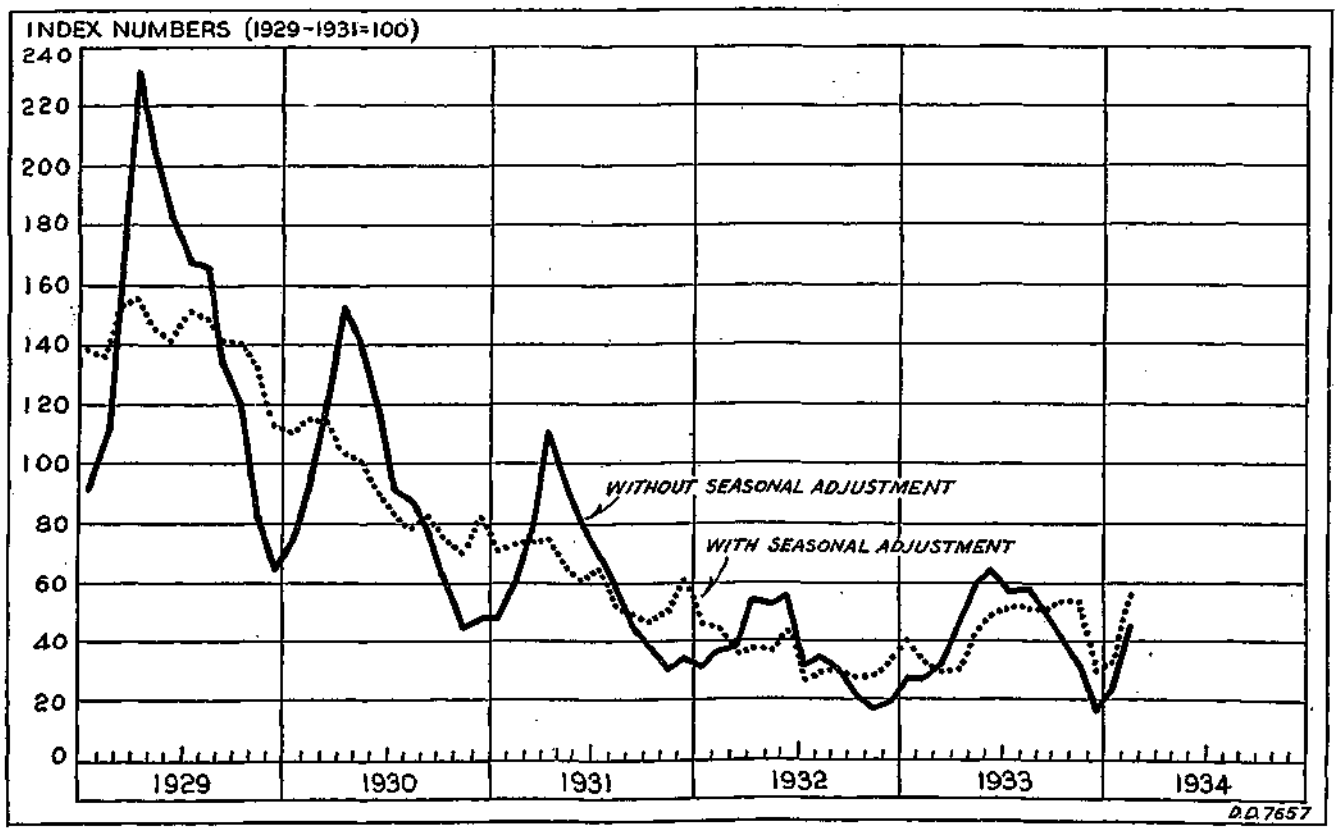

Chart I.—New passenger automobile sales.

in certain months because of lax enforcement of licensing provisions and other factors, which allow the holding over of a car sold in one month for registration in a later month when the cost of licensing will be lower. The months of June and July and December and January are especially affected by these factors.

During the last 2 months of 1932 and a considerable part of 1933 in particular there was an unusual and consistent lag in registration totals behind the sales figures, the variation amounting to from 1 to 15 percent, the average being almost 6 percent.[3]

Basic Sales Data

The unit sales figures upon which this index is built are those reported each month to the National Automobile Chamber of Commerce by individual manufacturers. They are the unit sales, in terms of the number of cars, made by the retail dealers of each manufacturer and represent more than 95 percent of all passenger car sales. These data are furnished to the Bureau in the total only, with the understanding that they are to be held confidential and used only in computing the present series of index numbers. As these figures were not collected prior to 1930, it was necessary to splice them to registration data for 1929. In view of the fact that during 1930, 1931, and 1932 there was a fairly close correlation between the two sets of figures (the average monthly discrepancy being less than 5 percent) this procedure seemed to be entirely satisfactory. In splicing these data, correction was made for the bias in the registration figures, occasioned by licensing evasion and other factors, by raising or lowering them in accordance with their average deviation from unit sales during the years 1930 through 1933.

Index of "Average Price Realized"

Since an index of dollar volume was desired, the first problem presented was that of securing some factor for converting the number of cars sold into dollar sales. For this purpose an "average realized price" was developed.

Use of a conventional type of price index with constant weights was considered and rejected. Such an index shows the price changes of a constant specification of materials, quality, etc., and expressly avoids reflecting over a short period of time any shift of the volume of trade or consumer demand from one price class of goods to another. Something equivalent to an index of average dollars realized per unit sold is needed for conversion purposes, when the objective is dollar evaluation of unit sales figures (or for that matter when the opposite problem of "deflation" of dollar figures to estimate physical volume is in view). It is impossible to build a single price index capable of serving these two divergent purposes. In the case of automobiles the rapidly increasing popularity of low-price cars during the depression (see chart II) made it imperative to construct new price conversion factors.

Some preliminary tests were made with a sample group of eight makes of cars in four price classes, chosen because the relationship which their registrations bore to the total registrations of the sample was approximately the same as that which the total registrations of each price class bore to the aggregate registrations of all cars in 1933. These tests indicated that such a sample would not be satisfactory for computing an average realized price each month, because of the very noticeable changes in relationship which occurred between individual makes of cars from month to month and between price classes over longer periods of time.

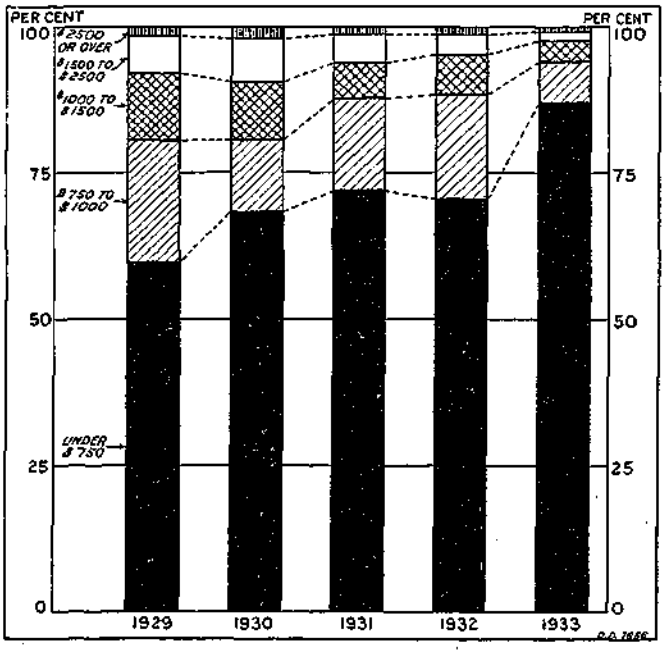

Chart II.—Percentage of automobile registrations by price classes.

To have kept such a sample representative it would have been necessary to add cars to the sample or drop others already there at fairly frequent intervals. It would appear that the principal difficulty in securing a small, constant, representative sample is due to the fact that the entire group is small, and because variations of importance occur within the sample.

Since the total number of models (from 50 to 70) for which registration data are available is relatively small, it was thought best to use the entire group in calculating the average price rather than attempt further to set up a sample group, the value of which would be open to question. This eliminated any doubt as to adequacy of the sample and did not make the computation of the average price too burdensome.

The price of the standard sedan of each car model was weighted each month by all registrations of that

[3] The data in this index supplement rather than conflict with the information provided by registration figures. The Bureau will not publish any information as to actual unit or dollar sales by makes and models, or by States; and as to country-wide totals it proposes to publish only index number and percentage changes.

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model (regardless of what body type) for the month.[4] In the case of two cars available information indicated that the coach was the more popular body type and its price was used instead of that of the standard sedan. The use of the one price was dictated by the fact that there was no way to determine what percentage of the registrations of each model was made up of each body type, such as roadster, coupe, sedan, etc. The results obtained by multiplying the sedan price of each model by total registrations of that model were then added together to arrive at a grand total valuation of all cars sold. This sum was in turn divided by the total number of registrations for the month which gave the "average realized price" or conversion factor for that month.

Passenger Automobile Price Index

Month	Realized retail price (weighted average)					
	1929	1930	9131	1932	1933	1934
January	$830.75	$808.15	$761.26	$770.56	$655.80	[1] $687.19
February	804.63	755.71	746.11	816.53	665.39	
March	834.06	767.01	738.74	842.83	716.35	
April	842.49	779.75	737.46	795.36	643.20	
May	834.12	771.86	728.77	710.35	675.83	
June	821.48	772.25	732.10	662.15	621.30	
July	806.33	766.05	739.72	650.76	611.42	
August	837.37	815.52	738.87	677.82	604.91	
September	833.11	825.64	756.78	685.75	617.13	
October	837.61	839.82	773.39	716.27	616.86	
November	824.21	832.86	789.91	721.21	628.84	
December	825.10	779.37	763.67	693.22	627.34	

[1] Preliminary.

While the use of the price of the standard sedan as the characteristic or average price of all the body types within a particular model is somewhat arbitrary, there is considerable justification for it. The first justification is that almost 95 percent of all cars produced are closed cars. Of all cars produced 38 percent are 4-door sedans and almost 31 percent are 2-door sedans.[5] Nearly 25 percent are coupes.

Body type	1930		1931		1932	
	Number	Percent	Number	Percent	Number	Percent
Touring	77,948	2.7	33,151	1.6	11,349	1.0
Roadster	202,081	6.9	111,119	5.5	36,104	3.0
Coupe	700,827	24.1	504,447	24.8	290,697	24.5
2-door sedan	782,276	26.9	524,050	25.7	362,060	30.6
4-door sedan			784,873	38.5	450,978	38.0
All other closed cars [a]	1,119,116	38.4	65,804	3.2	17,159	1.4
Chassis	27,939	1.0	14,739	0.7	17,262	1.5
Total	2,910,187	100.0	2,038,183	100.0	1,186,209	100.0

[a] Included 4-door sedans in 1930.

This clustering of prices around the standard sedan is because most manufacturers draw up their price list with the sedan as the base. A further indication of this tendency is the following comparison of the December 1933 prices of the coupe, coach, and sedan of each of 64 models which showed the cost of the coupe and coach to rank as follows, in relation to the sedan:

(*a*) In 21 instances one was higher priced and one was cheaper than the sedan.
(*b*) In 17 instances both were cheaper than the sedan.
(*c*) In 13 instances one was the same price as the sedan and one was cheaper.
(*d*) In 8 instances one was the same price as the sedan and one was higher.
(*e*) In 5 instances both were priced higher than the sedan.

In groups (*b*) and (*c*) there were 10 cases in which the use of the price of the convertible coupe or special coupe rather than the standard coupe would have caused them to fall in group (*a*).

[4] Registration data are used here because unit sales figures are available in total only and not by make, by model, or by body type. The necessary assumption is that, even though registrations do not coincide with unit sales, the relationships among the different models will be the same in either instance. The data used were those from service E of the R. L. Polk Co., which compiles each month the number of registrations by makes and models.

[5] The following table showing passenger-car production by body types in the United States and Canada is from the 1933 edition of Facts and Figures of the Automobile Industry, published by the National Automobile Chamber of Commerce.

After the "average realized price" for each month had been obtained, it was used as the conversion factor for translating unit sales into estimates of dollar volume for that month.

The trend of the average price realized for the period 1929 to date is shown on chart III.

Reduction to American Daily Sales

In order to give comparability to months with a different number of days, these dollar estimates were reduced to a daily average sales basis,[6] giving equal weight to all the days of each calendar month, week days, Sundays, and holidays alike. This was for the reasons outlined in the following paragraph. A series of relative numbers, unadjusted for seasonal variations,

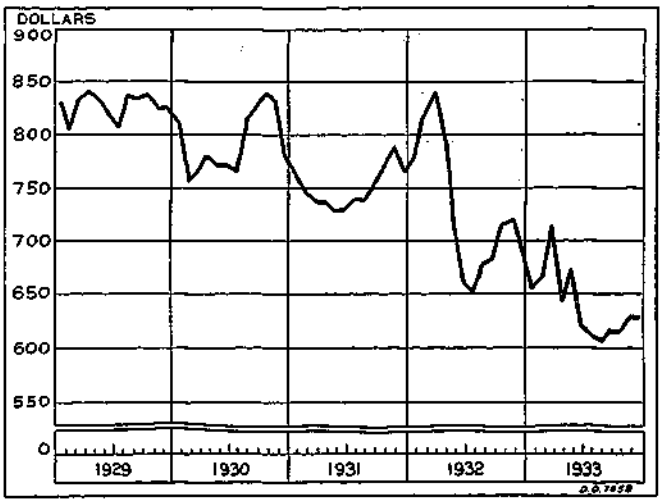

Chart III.—Average price of new passenger automobiles.

was then computed by dividing the sales on this basis by their average during the years 1929, 1930, and 1931.

Insofar as could be ascertained, only one automobile company had done any detailed work toward developing information from which it would be possible to assign proper weights to the different days of the week. This company furnished the results of its research to the Bureau for such use as might be made of them in constructing the present index, and with the qualification that the raw material on which it was based was rather restricted and that the weights calculated could only be considered as tentative. When the weights for the various days of the week arrived at by this company's method were used to reduce the monthly dollar estimates to daily average sales, there was an average discrepancy of only 1.3 percent between the relatives thus obtained and the figures derived when equal weight was given to all the days of the calendar month. The greatest difference in any one month was 3.9 percent. As the weights were tentative and were for one company only and the resultant discrepancy so small, it was felt that giving all days equal weight was sufficiently accurate until more data on the subject are available.

[6] Or what, for the purpose in hand, is its equivalent, sales per month of assumed constant length.

Selection of Base Period

The 3 years 1929–31 were chosen as the base period, i.e., every month's sales figure is expressed as a percentage of the average month's sales in the base period. The Bureau has found it practically impossible to secure satisfactory data with which to carry any of the new indexes back further than January 1929. The single year 1929 was considered as a base period with the thought that it would permit convenient relation of these figures to the Census of Distribution covering that year. But comparisons between the two sets of figures can be and have been made without setting it as a base period, and it was thought desirable not to risk the misinterpretation that 1929 might be called "normal" because its average month equaled 100.

Although 1929 yielded a much more exceptional peak volume of sales in automobiles than in staple lines, such as food products, motor car sales fell off more sharply than staples in the depression years immediately following. Experiments made with these facts in mind showed that the 3-year period chosen produced a more normal relation between the indexes of the various trades to be covered than did any other single year or available combination of years.

Seasonal Adjustment

Because of the wide seasonal fluctuations in the automobile trade, an index adjusted for such influence was computed in addition to the primary series. The short period covered by the series, and the fact that the original unit sales are linked to registrations for the year 1929, precluded the possibility of producing thoroughly satisfactory seasonal adjustment factors.

The seasonal factors developed were derived by a process which is in essence the "ratio-to-moving-average" method employed by the Federal Reserve Board in constructing certain of its indexes, notably its index of department-store sales.[7] Even with the short series of data available, rather pronounced evidence of a shift in seasonal relationships in certain months was visible, and the seasonal indexes used in the earlier years were somewhat different from those used for the later period.

The seasonal factors developed and used in this index (for this later period and for adjusting current data) are:

January	68.5	July	110.0
February	84.0	August	112.5
March	106.0	September	98.0
April	148.5	October	80.0
May	140.5	November	62.0
June	133.5	December	56.5

Each adjusted index number is the percentage ratio of the unadjusted index number (daily average basis) to the adjustment factor for that month.

These indexes will be carried regularly under the section, "Domestic Trade", when the next revision of data is made in the June 1934 issue. The indexes for the latest month, meanwhile, will be shown among the footnotes on page 26.

[7] A detailed description of this method will be found in Seasonal Variations in Wholesale and Retail Trade, reprinted from the Federal Reserve Bulletin for April 1928, pp. 236–242, available from the Division of Research and Statistics, Federal Reserve Board, Washington, D.C. A minor change in this method of calculation was necessitated in the present instance by the shortness of the period covered by the data. This slight modification in the measurement of seasonal variation was designed in particular to compensate for "cyclical distortion", elimination of which is more or less automatically provided by the Reserve Board's "ratio" method of computing seasonal variation under circumstances where data for a decade or more are available.

Index of Dollar Sales of New Passenger Automobiles

[1929–31=100]

Month	Without seasonal adjustment						With seasonal adjustment					
	1929	1930	1931	1932	1933	1934	1929	1930	1931	1932	1933	1934
January	90.8	74.1	47.3	31.2	28.1	22.9	138.5	110.5	70.5	45.5	41.0	33.4
February	111.4	94.6	59.7	36.8	27.8	[1] 47.1	136.5	114.5	72.5	44.0	33.0	[1] 56.0
March	168.8	122.5	79.9	38.4	32.6	.....	158.5	113.5	74.0	36.0	30.5	.....
April	232.7	154.5	112.0	55.5	45.5	.....	154.5	103.5	75.0	37.5	30.5	.....
May	205.0	141.4	94.3	52.1	59.9	.....	146.0	100.5	67.0	37.0	42.5	.....
June	183.2	118.2	80.8	56.5	65.2	.....	141.5	90.0	61.5	42.5	49.0	.....
July	168.0	91.5	70.9	31.0	57.5	.....	152.0	83.0	64.5	28.0	52.5	.....
August	167.0	87.8	58.8	34.0	58.3	.....	148.5	78.0	52.5	30.0	52.0	.....
September	133.8	78.7	47.2	30.5	51.2	.....	141.5	82.0	49.0	31.0	52.0	.....
October	120.0	62.6	38.5	22.3	42.7	.....	141.0	76.0	46.5	28.0	53.5	.....
November	82.8	44.0	30.8	17.6	33.0	.....	132.5	70.5	49.5	28.5	53.0	.....
December	65.1	46.9	34.5	19.3	17.3	.....	113.0	82.5	60.5	34.0	30.5	.....
Annual index	144.1	93.0	62.9	35.5	43.3	.....	.....	.....	.....	.....	.....	.....

[1] Preliminary.